

IN THE CLAIMS:

Please AMEND the claims as indicated below:

1. (CURRENTLY AMENDED) An optical switch expanding method for increasing the number of inputs and outputs of an optical switch comprising first to fourth optical matrix switches wherein a plurality of 2-input/2-output optical switch elements are arranged in a matrix to form a plurality of input ports, a plurality of auxiliary input ports, a plurality of output ports, and a plurality of auxiliary output ports, comprising ~~the steps of:~~

respectively connecting said auxiliary output ports in the first optical matrix switch to said input ports in the third optical matrix switch;

respectively connecting said output ports in the second optical matrix switch to said auxiliary input ports in the third optical matrix switch;

respectively connecting said output ports in the first optical matrix switch to said auxiliary input ports in the fourth optical matrix switch; and

respectively connecting said auxiliary output ports in the second optical matrix switch to said input ports in the fourth optical matrix switch, the first, second, third and fourth optical matrix switches together thereby being a non-blocking optical switch.

2. (CURRENTLY AMENDED) An optical switch comprising first to fourth optical matrix switches wherein a plurality of 2-input/2-output optical switch elements are arranged in a matrix to form a plurality of input ports, a plurality of auxiliary input ports, a plurality of output ports, and a plurality of auxiliary output ports, and wherein:

said auxiliary output ports in the first optical matrix switch are respectively connected to said input ports in the third optical matrix switch;

said output ports in the second optical matrix switch are respectively connected to said auxiliary input ports in the third optical matrix switch;

said output ports in the first optical matrix switch are respectively connected to said auxiliary input ports in the fourth optical matrix switch; and

said auxiliary output ports in the second optical matrix switch are respectively connected to said input ports in the fourth optical matrix switch, the first, second, third and fourth optical matrix switches together thereby being a non-blocking optical switch.

3. (ORIGINAL) The optical switch according to claim 2, wherein the first to fourth optical matrix switches are Cross-bar optical matrix switches.

4. (ORIGINAL) The optical switch according to claim 2, wherein said 2-input/2-output optical switch elements are semiconductor optical switches.

5. (ORIGINAL) The optical switch according to claim 2, wherein said 2-input/2-output optical switch elements are optical switches in an opto-micro-electromechanical system.

6. (ORIGINAL) The optical switch according to claim 2, wherein the first to fourth optical matrix switches are PI-LOSS optical matrix switches.

7. (CURRENTLY AMENDED) An optical crossconnecting apparatus comprising:
a plurality of optical demultiplexing means for demultiplexing, on a wavelength basis, input light so as to be output from a plurality of output ports;

a plurality of optical multiplexing means for wavelength-multiplexing light which have been input to a plurality of input ports; and

a non-an-blocking optical switch comprising, and wherein: said optical switch comprises

first to fourth optical matrix switches wherein a plurality of 2-input/2-output optical switch elements are arranged in a matrix to form a plurality of input ports, a plurality of auxiliary input ports, a plurality of output ports, and a plurality of auxiliary output ports,

said auxiliary output ports in the first optical matrix switch are respectively connected to said input ports in the third optical matrix switch₁

said output ports in the second optical matrix switch are respectively connected to said auxiliary input ports in the third optical matrix switch₁

said output ports in the first optical matrix switch are respectively connected to said auxiliary input ports in the fourth optical matrix switch₁

said auxiliary output ports in the second optical matrix switch are respectively connected to said input ports in the fourth optical matrix switch₁

said input ports in said optical switches are connected to a plurality of output ports in said optical demultiplexing means₁ and

said output ports in said optical switches are connected to a plurality of input ports in said optical multiplexing means.

8. (CURRENTLY AMENDED) An optical cross-connecting apparatus comprising:

a plurality of optical demultiplexing units to demultiplex, on a wavelength basis, input light to be output from a plurality of output ports;

a plurality of optical multiplexing units to wavelength-multiplex light input to a plurality of input ports; and

a non-an-blocking optical switch comprising:

first to fourth optical matrix switches, wherein a plurality of 2-input/2-output optical switch elements are arranged in a matrix to form a plurality of input ports, a plurality of auxiliary input ports, a plurality of output ports, and a plurality of auxiliary output ports, said auxiliary output ports in the first optical matrix switch being respectively connected to said input ports in the third optical matrix switch, said output ports in the second optical matrix switch being respectively connected to said auxiliary input ports in the third optical matrix switch, said output ports in the first optical matrix switch being respectively connected to said auxiliary input ports in the fourth optical matrix switch, said auxiliary output ports in the second optical matrix switch being respectively connected to said input ports in the fourth optical matrix switch, said input ports in said optical switches being connected to a plurality of output ports in said optical demultiplexing units; and said output ports in said optical switches being connected to a plurality of input ports in said optical multiplexing units.

9. (CURRENTLY AMENDED) An optical switch to receive and output at least sixteen signals, comprising:

four nxn optical matrix switches, each having at least sixteen 2-input/2-output optical switch elements arranged in a matrix and providing that two of the four optical matrix switches receive at least sixteen input signals, the four nxn optical matrix switches being connected to form four input ports, four auxiliary input ports, four output ports, and four auxiliary output ports such that each of the sixteen optical signals received passes through no more than two of the four nxn optical matrix switches to provide one of sixteen output signals output by the other two of the four optical matrix switches, the four nxn optical matrix switches together thereby being a non-blocking optical switch.

10. (NEW) An apparatus comprising:

four nxn optical matrix switches connected together to provide a 2nx2n non-blocking optical switch configured so that any input is switchable to any output while passing through no

more than two of the four $n \times n$ optical matrix switches.

11. (NEW) An apparatus comprising:
four $n \times n$ optical matrix switches; and
means for connecting the four $n \times n$ optical matrix switches together to provide a $2n \times 2n$ non-blocking optical switch configured so that any input is switchable to any output while passing through no more than two of the four $n \times n$ optical matrix switches.

12. (NEW) An apparatus comprising:
four 4×4 optical matrix switches connected together to provide an 8×8 non-blocking optical switch configured so that any input is switchable to any output while passing through no more than two of the four 4×4 optical matrix switches.

13. (NEW) An apparatus comprising:
four 4×4 optical matrix switches; and
means for connecting the four 4×4 optical matrix switches together to provide an 8×8 non-blocking optical switch configured so that any input is switchable to any output while passing through no more than two of the four 4×4 optical matrix switches.